National Institute of Environmental Health Sciences

Impacts of extreme air temperatures on cyanobacteria in five deep peri-Alpine lakes

Author(s): Gallina N, Anneville O, Beniston M
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Abstract:

Cyanobacteria are of major interest in freshwater ecosystems, since they are able to produce toxins with potentially negative impacts on the environment, health and thus on economics and society. It is therefore important for water management authorities to assess the manner in which cyanobacteria may evolve under climate change, especially in the Alpine Region where warming is projected by climate models to be More important than the global average. In this study, air temperature extremes under current climate were used as a proxy for future "average" climate forced by enhanced greenhouse gas concentrations. The impacts of extreme temperature events on cyanobacteria were analyzed in five deep pen-Alpine lakes, covering the entire trophic gradient and using a synoptic approach. Extreme air temperatures were observed to alter the biomass of the cyanobacteria community. In general, extreme hot events are associated with high biomass while extreme cold events are characterised by low biomass. However, the assessed air temperature extremes did not lead to a dominance of cyanobacteria over the other phytoplankton groups, which also showed responses in relative biomass change during extreme events. Both extreme hot and extreme cold events were seen to generate a loss of diversity among cyanobacteria. In addition, the use of extreme events as a proxy to "average" future climates is a useful approach to enhance possible impacts of Attire global warming on the biota in freshwater systems. The outcomes of a synoptic approach provide general responses and are a useful tool for further modelling purposes.

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Resource Description

Exposure : ☑

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Food/Water Quality, Temperature

Food/Water Quality: Biotoxin/Algal Bloom, Other Water Quality Issue

Water Quality (other): Cyanobacteria; Water temperature; Nutrients; Eutrophication

Temperature: Extreme Cold, Extreme Heat, Fluctuations

Geographic Feature: ☑

resource focuses on specific type of geography

Freshwater, Mountain

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Region

Other European Region: Peri-Alpine region

Health Impact: ☑

specification of health effect or disease related to climate change exposure

General Health Impact

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Other Projection Model/Methodology

Other Projection Model/Methodology: Cyanobacteria biomass

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Long-Term (>50 years)